

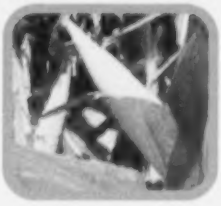

CROP TALK

Volume 11, Issue 4 OMAFRA Field Crop Specialists — Your Crop Info Source November, 2011

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Evaluation of Phosphorus Fertilizer Recommendations For Corn In Ontario

by Ken Janovicek, University of Guelph & Greg Stewart, Corn Specialist, OMAFRA

Background

Phosphorous (P) fertilizer recommendations and strategies in Ontario have been evaluated by the acquisition and analysis of research trials that looked at grain corn yield response to phosphorus fertilizer. Funding was provided by Environment Canada's "Lake Simcoe Clean-Up Fund" and the Ontario Ministry of Agriculture, Food and Rural Affairs.

The results from 113 Ontario research trials evaluating corn yield response to phosphorus fertilizers from 1967 to 2010 were entered into the database. Of the 113 trials, there were 71 trials which had multiple rates of phosphorus fertilizer where the maximum economic rate of phosphorus (MERP) was calculated. The other trials evaluated single application rates, multiple fertilizer products and/or placement options against a zero P control.

Economic Impact

The analysis suggests that corn yield and economic return potential is currently not limited by phosphorus availability when following OMAFRA phosphorus fertilizer rate recommendations. Ontario P rate recommendations are often more than adequate for the current year's grain corn production requirements, particularly when soil tests are in the range of 6 to 12 ppm. (Note - all references to soil test P refers to the OMAFRA-accredited sodium bicarbonate phosphorous soil test.)

Adjustment of MERP based on changes in the phosphorus:corn price ratio were determined to be relatively insignificant. For example, in the event that corn price doubles from $4.50/bu to $9.00/bu for a given P fertilizer price, the optimum P recommendation increases by about 9 lb/ac of P_2O_5.

Adjustments in phosphorus fertilizer rates based on soil test results will have a much larger impact on net returns than attempting to make the minor rate adjustments associated with changes in corn prices and phosphorus fertilizer costs.

Placement and Rates of P

Application of seed-placed fertilizers at P_2O_5 rates between 11 to 18 lbs/acre increase overall profits about 50% of the time. The likelihood of observing an economic yield response to seed-placed starter fertilizer was relatively unaffected by soil-test P levels. For example, a profitable seed-placed P fertilizer response was almost as likely to be observed at a soil test of 25 ppm as it was at 10 ppm.

Applying P fertilizer in a 2 X 2 inch (5 cm X 5 cm) band (2 inches below and 2 inches to the side of the seed) was associated with significantly larger increases in yields and profitability when compared to broadcast-applied phosphorus. Direct comparisons of banded and broadcast phosphorus fertilizer rarely occurred in the same trial. However trials with phosphorus applied in a 2 X 2 inch starter band tended to have larger yield increases compared to trials with broadcast-applied P when soil tests were within the range of 8 to 30 ppm. When soil test P is greater than 15 ppm:

- there was little economic benefit from applying phosphorus fertilizer to the current year's corn crop at rates exceeding 18 lbs /ac P_2O_5 and
- P should only be applied as a banded or seed-placed fertilizer to maximize the efficiency of phosphorus fertilizer use by corn.

A significant number of growers broadcast P at crop removal rates to maintain soil test levels (i.e. 60 lbs P_2O_5 for a 150 bu/acre corn yield). The data suggests very little economic benefit of this practice, especially for P soil tests above 15 ppm.

Potassium (K) Reminder

The database also incorporated some analysis of other starter fertilizer options. The key finding was that when soil-test K levels are less than 90 ppm, more consistent and larger corn yield increases can be expected with seed placed or 2 X 2 banded starter fertilizers that also contain K.

Manure - Tackling the Frequently Asked Questions

by Christine Brown, Nutrient Management Lead – Field Crops, OMAFRA

When fertilizer prices start to increase so do the number of questions asked about manure! Manure is a carefully guarded treasure – black gold – for livestock producers that have figured out the nutrient and organic matter value. However, this is a relatively new concept for many crop producers that have access to manure or other organic materials.

Why bother with manure?

Manure is nutrient rich and organic matter rich. However, just as with commercial fertilizers, manure must be managed to ensure the nutrients stay where they were applied. In addition to the nutrients found in commercial fertilizers (NPK), manure also has micro-nutrients, such as sulphur, zinc, manganese and calcium, and micro-organisms (including some pathogens) that benefit the soil and add diversity. Similar to commercial fertilizers, the value is only as good as the distribution. Uniform application using calibrated equipment is essential.

What is the difference between liquid and solid manure?

Apart from the obvious differences between liquid and solid manures, the biggest difference is nutrient composition. Phosphorus tends to be higher in solid manure, while potassium tends to be higher in liquid manure. The nitrogen composition makes the nitrogen from liquid manure more like commercial nitrogen sources, while solid manure nitrogen behaves almost as a slow-release nitrogen form. As a result, liquid manure can supply over half of a corn crop's nitrogen needs, while most cattle, sheep, or horse solid manure applications will require significant additional nitrogen.

When is the best time to apply manure?

Applying liquid manure before or into a growing crop is the best method of maximizing nutrients while minimizing environmental impact.

Weather isn't co-operating with my application plans. What are my options?

Soils are saturated and field tiles are running at full capacity. With a wet spring season and this fall's continuing wet weather, many manure storages are at, or close to capacity. A large acreage of corn is still standing in the field and risk of field damage from soil compaction makes any field work prohibitive, especially on heavier soils.

The following are a few options for manure application during a wet autumn. However in doing so, risk of water contamination from subsurface drainage systems and surface runoff must be considered.

1. Is this the year for custom application? A custom applicator with site specific or GPS capabilities is able to map where manure has been applied and at what rate, so that commercial fertilizer supplementation becomes easier next spring.

2. Consider alternative storage if available. Some neighbours may have sold their livestock, but still have manure storage space that could be "rented".

4. Injection of liquid manure is not a good option in wet soils. Wet soils smear more easily, especially when combined with additional and concentrated liquids at each injection point. Surface application onto crop residue or cover crops, followed by tillage at the earliest opportunity, will cause the least amount of compaction damage in wet soils.

5. If manure must be applied to snow covered fields, consider the soil under the snow. If the soil is frozen under the snow cover, the risk of snow melt combined with rain leading to contaminated runoff is high. Where will the runoff move? The nutrients may not be where they were intended.

6. Spread on fields or parts of fields with the least slope. Ideally, start with fields where there is no access to surface water. Water flow patterns are obvious in most fields during continued wet periods. Take note of those areas and avoid manure application where there is evidence of ponded water or "streams" through the field.

7. Keep your distance from watercourses. Normally under good spreading conditions, the recommended distance between liquid application and the watercourse is 13 meters (40 ft). Under winter contingency applications, the separation distance should be increased. In the nutrient management regulations, the minimum setback for liquid manure application increases to 100 meters (330 ft) with winter application where slope to the watercourse is greater than 3%.

8. Surface inlets or hickenbottoms act as a direct conduit to surface water. In a wet year, the risk of water contaminated with manure moving through surface inlets increases.

9. Keep application rates as low as possible – 5,600 imperial gallons (6,800 US gal) is the equivalent to ¼ inch (6 mm) evenly applied across spread width. Consider the soil conditions at the time of application. If a quarter inch of rain fell in one minute, would it runoff or move?

10. For all manure application options, monitoring is essential to ensure that contamination of water sources does not occur Just in case, the Spills Action Centre number is 1-800-268-6060. Murphy's Law - if the farm's contingency plan has been reviewed in advance, it probably won't be needed.

When should manure be incorporated?
Manure should be incorporated as quickly as possible after application. The key to incorporation is having the nutrients distributed uniformly though the seedbed. Injection is considered a form of incorporation. Injection is advantageous for reducing odour and decreasing loss from volatilization, especially with liquids.

How much fertilizer value will manure have?
Fertilizer value varies with manure type and livestock type. Feed rations, storage and addition of bedding or waste water will influence the nutrients applied. It is recommended that manure is sampled for nutrient analysis at the time of application.

How do I take a manure sample?
A manure sample is easiest to obtain at the time of application. The best method to know what nutrients were applied to the field is to take samples from various loads during application and then mix the subsamples to obtain one representative sample. If there is variation in the storage (not agitated or a solid manure pile), taking a sample for each field where manure is applied will give more accurate results and reveal how much variation there is in the storage.

How do I interpret an analysis?
A manure analysis should include dry matter, total nitrogen, ammonium nitrogen (NH4-N), phosphorus, and potassium. For solid manure, the carbon:nitrogen ratio (C:N ratio) will also be useful, especially where bedding is used.

- **Nitrogen**
  Total N – NH4-N = Organic N
  Organic N = slow release (20-30% available in year of application)
  NH_4-N = quickly available (decreases as it remains un-incorporated)

- **Phosphorus**
  liquid: (% P x 1.84) x 100 = lbs/1000 gal of P_2O_5 added to soil
  solid: (% P x 1.84) x 20 = lbs/ton of P_2O_5 added to soil.
  Where soil fertility levels are very low, only a portion of the phosphorus will be available in the year of application.

- **Potash**
  liquid: (% K x 1.08) x 100 = lbs/1000 gal of K_2O added to soil
  solid: (% K x 1.08) x 20 = lbs/ton of K_2O added to soil.

Frost Seeding Forages - How to Plan Ahead For Success

by Gilles Quesnel, Field Crop IPM Program Lead, OMAFRA, Kemptville

"Frost seeding" is the broadcasting of forage seed on frozen ground in late-winter or early-spring. Frost seeding can be an effective way of improving the forage quality and yield of thinning pastures and hay fields. It allows for the establishment of forages in an undisturbed sod at reduced cost and also shortens the non-grazing period in the spring.

The key to successful forage establishment with frost seeding is to start planning the fall of the prior year. For frost seeding to be successful, the top growth of the existing stand needs to be removed in late fall. This accomplishes two things:

1. exposes bare soil for improved seed-to-soil contact at seeding time, and
2. reduces the vigour and competition of the existing stand in early spring.

Site Selection

For seeds to germinate there needs to be good seed-to-soil contact. The best sites for successful frost seeding are thinning grass stands with some exposed soil. Seedling establishment will be improved by overgrazing or clipping the stand to 5 cm (2 inches) the previous fall (Figure 1). This will open the sod, allowing for greater freezing and thawing action. This results in better seed-to-soil contact and will also weaken the existing plant growth to reduce early competition. Frost seeding is least successful in fields with thick sod.

Figure 1. Canopy clipped to 2 inches with bare soil visible

Time of Seeding

For most of Ontario, the best time to frost seed is from mid-March to early-April, once the snow is all or nearly all melted. Ideally, the ground freezes and thaws at least 2 to 3 times after the seed is broadcasted. This freeze-thaw action helps to incorporate the seeds into the soil surface. Avoid frost seeding on top of snow where run-off from rapid snow melt will wash the seed away.

Equipment

While a grain drill is ideal for uniform seed placement and distribution, drills are not likely able to handle the frozen ground and snow conditions that occur when frost seeding is typically done. Frost seeding is most often done using a spinner–spreader on an all-terrain vehicle (ATV), snowmobile or tractor. In small areas or areas that are very rough, a hand-held broadcaster may be the preferred option.

Species Selection

Red clover is the easiest forage species to successfully frost seed. (Figure 2) The seed is dense, which improves seed-soil contact. It also germinates at low temperatures and has high seedling vigour, allowing it to start growing early in the spring. However, it is short-lived, so frost seeding of red clover may have to be done every 2 – 3 years or so.

Birdsfoot trefoil and white clover have been frost seeded with varying degrees of success. Trefoil is more difficult and slower to establish than red clover, but it has the advantage in pasture situations of being "non-bloating". Once established, it will grow well under a wide range of growing conditions. It has the ability to reseed itself, so it persists much longer than red clover.

Figure 2. Frost seeded red clover at 3rd trifoliate

Alfalfa is not well suited for frost seeding because auto-toxicity prevents new alfalfa seedlings to grow in the presence of a mature alfalfa plant.

Grass species are much more difficult than legumes to frost seed successfully. Research at the University of Wisconsin by Dr. Dan Undersander demonstrated greater establishment success with orchardgrass and Italian (annual) ryegrass than with timothy or reed canarygrass. Smooth bromegrass was intermediate for successful frost seeding establishment, but it is more winter hardy and persists longer than orchardgrass or Italian ryegrass.

Frost Seeding Rates

Species	Seeding Rate lbs/acre [1]
Red clover	3 – 7
White clover	2 – 3
Birdsfoot trefoil	3 – 6
Orchardgrass	3 – 4
Italian ryegrass	4 – 8
Bromegrass	6 – 12

[1] 1 kg/ha = 0.88 lb/ac

- Use the higher seeding rates when significant bare ground is visible
- Use the lower seeding rates when using a seed mixture

Fertilizing
While phosphorus fertilizer benefits the establishment of new seedlings, fertilizing a field in a frost seeding situation has the disadvantage of encouraging growth of the existing plants. A better option is a late-summer application of phosphorus and potash to promote growth and winter persistence of the newly established legumes.

In the year of seeding, if an adequate stand is established (40% or more legume), avoid the application of nitrogen (N) fertilizer. Nitrogen fertilizer will increase the competition from grasses. In stands where there is a low level of legume, there will be a yield response from the grasses to additional N. If nitrogen is applied to increase production, it should be limited to less than 50 kg/ha (44 lbs/ac) of actual N during the first season.

Harvest Management
Once the new seedlings are established, regular grazing or harvest will reduce competition from existing grasses and allow light penetration into the canopy. In the year of establishment, avoid overgrazing by keeping at least 5 - 8 cm (2 - 3 inches) of top growth.

Don't Ignore Phosphorus Needs of Canola

by Brian Hall, Canola & Edible Bean Specialist, OMAFRA

Although nitrogen and sulfur receive considerable attention in canola production, phosphorus (P) rate and placement are important factors in yield management.

The current OMAFRA phosphorus recommendations for canola are the same as oats. (www.omafra.gov.on.ca/english/crops/pub811/6fertility.htm#phosphate) At soil tests over 15 ppm of P (sodium bicarbonate test), there is a low probability of a yield response to applied phosphorus. Canola is more efficient at extracting soil P than cereals, so cereal crops are more likely to respond to higher P application rates. The availability of phosphate is very small compared to the entire pool of phosphorus in the soil The root system of canola secretes organic acids that help increase the availability of phosphorus. Canola also produces longer root hairs than many plants, which increases the volume of soil from which it can absorb P. Canola uptakes phosphorus from the soil rapidly in the early growth stages and continues to remove phosphorus for up to about 8 weeks. Over the cropping cycle, applying sufficient P to meet crop removal may be desirable to prevent long term depletion. A canola crop yielding 1 tonne/acre will remove about 30 lb/ac (34 kg/ha) of P (P_2O_5), equivalent to 0.8 lb/bushel. Check soil phosphorus levels every 2 - 4 years to see that soil tests are in the desired range.

Research trials have shown that the largest response to starter fertilizer generally occurs on soils that test low to medium in phosphorus.

Phosphorus Banded Near the Seed Most Effective
Phosphorus moves very little in the soil and is easily tied up. Placement where roots can quickly access it is critical, especially in cold soils. At 5°C, phosphorus is five times less available than at 25°C. Canola requires phosphorus earlier than wheat. The small seed size of canola limits the amount of P reserves for early crop growth. Phosphorus reserves in canola seed will support seedling development for about one week. In wheat, reserves are sufficient to support seedlings for about 2 weeks.

Western Canada canola phosphorus research indicates maximum yield return from the first 17 - 22 kg/ha (15-20 lb/ac) of seed-placed phosphate (P_2O_5) or 33 - 44 kg/ha (30–40 lb/ac) if side-banded, even on high testing soils. On low testing soils, research has shown a good response obtained with application rates of 20 - 34 kg/ha (18 - 30 lb/ac). The low mobility of P limits how much you can reduce P application rates because of the distance between fertilizer granules and the seed. Banding 11-52-0 (MAP) fertilizer at rate of 38 lb/ac MAP (20 lb/ac P_2O_5) places fertilizer granules about 2 inches (5 cm) apart, which is sufficient for seedlings to reach easily. When P is broadcast it generally takes 2 - 4 times the rate of banded P to obtain the same yield increase.

Seed Safety When Applying N, K and S
Canola seedlings are much more sensitive to seed-placed fertilizer than cereals or corn. Monoammonium phosphate (MAP 11-52-0) has a low salt index and does not produce ammonia, so it has a low relative toxicity to seedlings. Field variability including eroded knolls, low organic matter soils, dry soils, or cloddy furrows will increase risk of injury. In Ontario, the recommendation for canola is for a maximum rate of 20 kg/ha (18 lb/ac) of phosphate fertilizer (35 lb/ac MAP) drilled with the seed. Nitrogen, except as monoammonium phosphate (MAP), and potash should not be applied with the seed. Generally, it is recommended that the rate of nitrogen not exceed 11 kg/ha (10 lb/ac). Sulphur can also be toxic when seed placed, especially ammonium sulphate.

Microessentials S-15, a Mosaic Company product, is a blend of MAP, ammonium sulphate and elemental sulphate (13-33-0-15 S). Each fertilizer granule contains all 3 elements (N,P,S), with 50% of the S as elemental S that is not available during the seeding year. In 2010 western Canada trials, S-15 performed well, with good seed safety and excellent P availability. Current research shows little differences in performance between MAP and other 'newer' formulations of P, such as liquid versus dry, orthophosphates, polymer coatings, and Avail.

Introducing Web-Based Refuge Selector Tool

by Cara McCreary, Field Crops Entomologist, OMAFRA & Jocelyn Smith, University of Guelph Ridgetown Campus

The Canadian Corn Refuge Hybrid Selector is a web-based tool that provides all the information needed to follow up-to-date insect resistance management (IRM) requirements for all currently available Bt corn hybrids in Ontario. This Refuge Selector was developed through collaboration of the Canadian Corn Pest Coalition, the Ontario Corn Committee, and the Canadian Seed Trade Association.

Simply select the Bt hybrid or trait being planted and the field size. The Refuge Selector will provide a list of eligible refuge hybrids, the refuge size, placement and treatment options along with herbicide tolerance information. The Refuge Selector can be accessed through the Canadian Corn Pest Coalition website http://www.compest.ca or http://www.refugeselector.ca. It's an excellent tool to help you place your 2012 seed order.

Biomass Getting Some Face Time

by Ian McDonald, Applied Research Co-ordinator, OMAFRA

The first Ontario Regional Biomass Tour was held Sept. 26th to October 3rd. This was an opportunity for people interested in all facets of the emerging biomass industry to get a feel for the level and scope of activities that are ongoing across Ontario. The Tour was organized by the Ontario Soil & Crop Improvement Association (OSCIA) and the Ontario Ministry of Agriculture, Food & Rural Affairs.

Components of the biomass value-chain included in the tour were:

- production fields of switchgrass, big bluestem, Miscanthus, sweet sorghum, pearl millet, hybrid poplar and willow, and crop residues,
- discussions with researchers who were exploring establishment, and other agronomics for successful biomass production,
- processing facilities capable of processing biomass,
- development of product precursors from crop biomass and recyclable ag plastics, and
- end use products of biomass, including heat, materials, and consumer products.

Twenty-two stops from Learnington to Belleville were toured. People could attend as many or as few of the stops as fit their schedules.

Participants and hosts surveyed all expressed interest in developing this into an annual event. Organizers and participants were pleased with the event and look forward to welcoming a larger number of participants to the tour next fall.

It was rewarding to see the hard work of these innovative farmers coming to bear on developing markets for this new class of crops. The interest from business and government in biomass research and development was also encouraging. While it is often extremely difficult to develop new industries, and despite having a long way still to go, those involved are optimistic that we are working in the right direction.

The farmers involved and those scratching at the surface are seeing that these crops have potential for commercial production in Ontario. The end use industries are seeing opportunities that these crops provide. With the release of commercial product now available at chains such as Home Hardware and Canadian Tire, we are beyond "proof of concept" and ready to take the next steps.

Work continues at all levels on developing the agricultural biomass industry. The "Ontario Field-Scale Agricultural Biomass Research Project" of OSCIA is establishing and monitoring 900 acres of biomass crops with innovative farmers from across Ontario. Research is also taking place at Kemptville, Elora, Simcoe, Delhi, Ridgetown, Learnington and other locations. The Ontario Federation of Agriculture, through an Agricultural Adaptation Council funded project to commercialize biomass in Ontario, is exploring the logistical, feasibility and market opportunities that need to be developed.

ESN® Controlled Release Fertilizer On Spring Wheat

by Scott Banks, Emerging Crop Specialist, Kemptville OMAFRA

ESN® is a fairly new product that uses a micro-thin polymer coating to encapsulate a nitrogen (N) granule. This coating is to protect the N from loss to the environment and releases it based on temperature and soil moisture, theoretically a bit later in the plant's growth when the crop needs it. To evaluate the effectiveness of this product, the Ottawa-Rideau Regional Soil & Crop Improvement Association examined the yield, quality response, and economic benefits of ESN® Controlled Release Fertilizer, also know as "Smart Nitrogen" use in spring wheat production.

2011 Results

Results from two on-farm sites in eastern Ontario in 2011 showed no advantage in grain yield or protein content with the use of ESN® (Table 1). There was no significant difference in residual soil nitrogen levels, indicating there was not an environmental benefit. There was also no impact on the percentage of Fusarium Damage Kernels (FDK%) or in the grain toxin levels as measured by VOM.

Differences between ESN® treatment[2] compared to urea

Yield / Quality Trait	½ Nitrogen Rate	Full Nitrogen Rate
Yield @14.5% (bu/ ac)	-0.6	-1.1
Protein %	-0.3	-0.6
Residual Soil Nitrogen (Post-Harvest) kg/ha	-1.7	1.6
FDK %	0.0	-0.1
VOM (ppm)	0.0	0.0

[1] 2 sites located in eastern Ontario
[2] 50% ESN & 50% urea by unit of actual N

A Look At All 3 Years

This three year project was done in 2009, 2010 and 2011. There was no increase in grain yield or protein in either of the 2009 or 2011 growing seasons. Residual soil N levels where similar between all treatments in each of the three years of the project, indicating no environmental benefit to the ESN® fertilizer.

In 2010, only one of the two sites had a positive yield response, with about an extra 4.5 bushels per acre using a full rate of ESN®-urea blend as compared to the straight urea. The ESN®-urea blend treatment also increased grain protein about 0.5%. However, this was above the maximum protein premium of 12.5% for hard red spring wheat, so there was no additional economic advantage in this situation.

Why was there some response in 2010, but none in 2009 or 2011? Do certain weather and soil conditions increase the likelihood of seeing improved yield or quality? In 2010, May was a dry month receiving only about half of the normal rainfall, whereas in May of 2009 and 2011, rainfall was closer to the norm for the area. If we could predict when we will have a 'dry spring' this might enable us to use the product more strategically to increase the possibility of an economic benefit.

Plot Set-Up

Two on-farm spring wheat plots were established each year. In 2009, 100% ESN® was compared to 100% urea. In 2010 and 2011, a 50% ESN® and 50% urea blend were applied and compared to 100% urea. All comparisons were at equivalent nitrogen rates to the straight urea treatments. All the nitrogen was applied at planting at two different rates in both years:

1. the grower's standard N rate, and
2. one-half the grower's standard rate.

The one-half grower standard rate treatment was used to determine if ESN® yielded more grain or higher protein in spring wheat under a lower available nitrogen situation. At harvest, plots were weighed and measured for moisture and test weights. Spring wheat samples were collected and the grain analyzed for protein, FDK% and Vomatoxin. A full project report will be included in the Crop Advances publication available at the Ontario Soil & Crop Improvement Association's Annual Meeting in February 2012.

Soil Test Your Hay Fields To Manage Phosphate & Potash Levels

by Joel Bagg, Forage Specialist, OMAFRA

Good fertility is essential to forage crop yields, persistence and profitablity. Hay prices are trending upwards. With corn and soybean prices and land costs increasing rapidly, it is essential to increase the management our hayfields. While there are many agronomic considerations to look at, phosphorus (P) and potassium (K) fertility management is often overlooked in forage production. P and K is fundamental to remaining competitive with grain crops in today's market.

Crop Removal of P and K

Forage crops remove a lot of nutrients and therefore have high nutrient requirements. With an alfalfa-grass mixture, a typical amount of P and K removed per tonne of hay harvested is equivalent to 13.5 lbs (6.1 kg) of P_2O_5 and 54 lbs (24.6 kg) of K_2O. As an example, assuming a mixed stand with a modest yield of 3.2 tonnes per acre per year, hay will remove about 43 lbs (19.6 kg) of P_2O_5 and 173 lbs (78.4 kg) of K_2O every year.

Unlike nitrogen, forage crops cannot generate P or K out of thin air. Without replacing P and K with manure or commercial fertilizer, the soil tests will drop quickly. Assuming that it takes about 35 lbs/ac of P_2O_5 and 20 lbs/ac of K_2O to move the soil tests by 1 ppm on some soils, after only 4 years the P soil test could drop by 5 ppm and the K by 35 ppm. This is easily enough to significantly reduce forage yields if soil test levels drop below optimum levels. We also need to maintain soil nutrient levels for the next crops in the rotation. At lower soil test levels, this "soil mining" is not acceptable. Yet it goes on in many hay fields every year.

There is a wide range of soil fertility levels found in hay fields across the province. Dairy farms that apply a lot of manure typically have high P and K levels. However, K deficiency has become more common in many crop fields. Hay fields that are infrequently (or never) rotated that seldom (or never) receive manure or commercial fertilizer are typically very low in soil fertility and yield.

Soil Testing

Soil testing is essential. Knowing how much P and K is in the soil to start with is critical. Take a representative soil sample, send it to an accredited lab and use the results to determine optimum fertilizer rates. Keep records. Monitor whether fertility is increasing, decreasing or staying in an optimum range over time. Soil samples should be taken at least every 3 years. The time and effort it takes to do the soil sampling seems to be a obstacle, but with the cost of fertilizer there is likely no greater potential return on the cost and extra effort. Compare your fertilizer bill with lab and mailing costs plus an incentive for the kids to do the sampling for you! Refer to OMAFRA Factsheet 06-031 "Soil Sampling & Analysis" www.omafra.gov.on.ca/english/engineer/facts/06-031.htm.

Soil Analysis Report Interpretation

When you get your report, check the sodium bicarbonate phosphorus (P) and ammonium acetate potassium (K) soil test levels (ppm). (Use only these tests, as other tests (Bray or Mehlich) cannot be interpreted using our calibration data.) How do the P and K soil test levels look?

Figures 1 and 2 show the yield response of alfalfa to various P and K soil test levels. The yield curve is quite steep when P gets much below 12 ppm and and K below 120 ppm. A positive yield response from applying fertilizer will be seen when soil tests are below these levels. On the flip side, the yield curve at high soil fertility levels is flat. Don't expect any extra yield from applying fertilizer once the soil test have been built up to higher levels. In these cases, you can choose to apply fertilizer to replace the nutrients removed by the crop to prevent future nutrient deficiencies, but don't expect extra yield from that maintenance application.

Figure 1

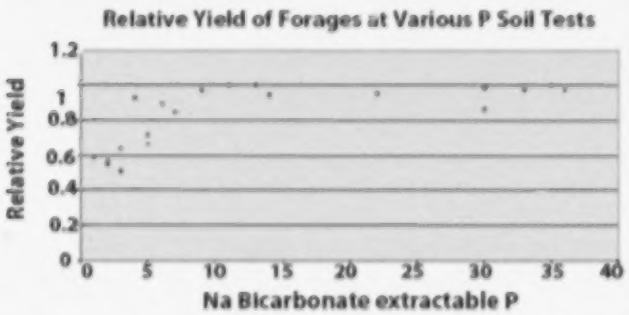
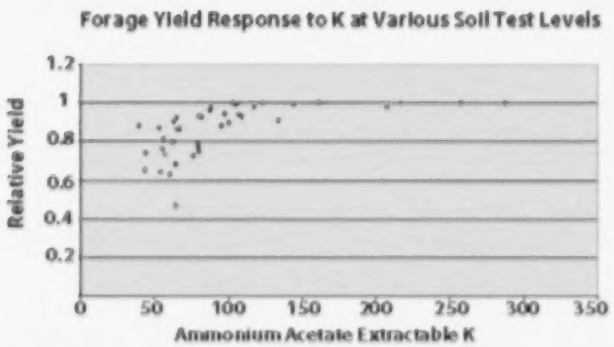


Figure 2



P & K Recommendations For Established Stands

Tables 1 and 2 provide the OMAFRA P and K recommendations on established forage stands. If manure is applied, reduce the fertilizer application according to the amount of P and K in the manure. For P and K recommendations at seeding (banded or not, with or without a nurse crop), or information on nitrogen rates, pH, manure application and micronutrients (boron, sulfur), refer to the Forage Fertility section of OMAFRA Publication 811, *Agronomy Guide*. www.omafra.gov.on.ca/english/crops/pub811/3fertility.htm

Table 1 – **Phosphate Recommendations For Established Forage Stand (Based on OMAFRA-Accredited Soil Tests)**

Sodium Bicarbonate Phosphorus Soil Test (ppm)	Established Forage Stand	
	Rating [1]	Phosphate (P_2O_5) Required kg/ha
0 – 3	HR	180
4 – 5		120
6 – 7		90
8 – 9		60
10 – 12	MR	30
13 – 15		20
16 – 20	LR	0
21 – 25		0
26 - 60	RR	0
61 +	NR	0

[1] HR, MR, LR, RR & NR denote respectively – high, medium, low, rare and no probabilities of profitable crop response to applied nutrient. Profitable response to applied nutrients occurs when the increase in crop value from increased yield is greater than the cost of the applied nutrient.

Table 2 – **Potash Recommendations For Established Forage Stand (Based on OMAFRA-Accredited Soil Tests)**

Ammonium Acetate Potassium Soil Test (ppm)	Established Forage Stand	
	Rating [1]	Potash (K_2O) Required kg/ha
0 – 15	HR	480
16 – 30		400
31 – 45		320
46 – 60		270
61 – 80		200
81 – 100		130
101 – 120	MR	70
121 – 150		20
151 – 180	LR	0
181 – 250	RR	0
251 +	NR	0

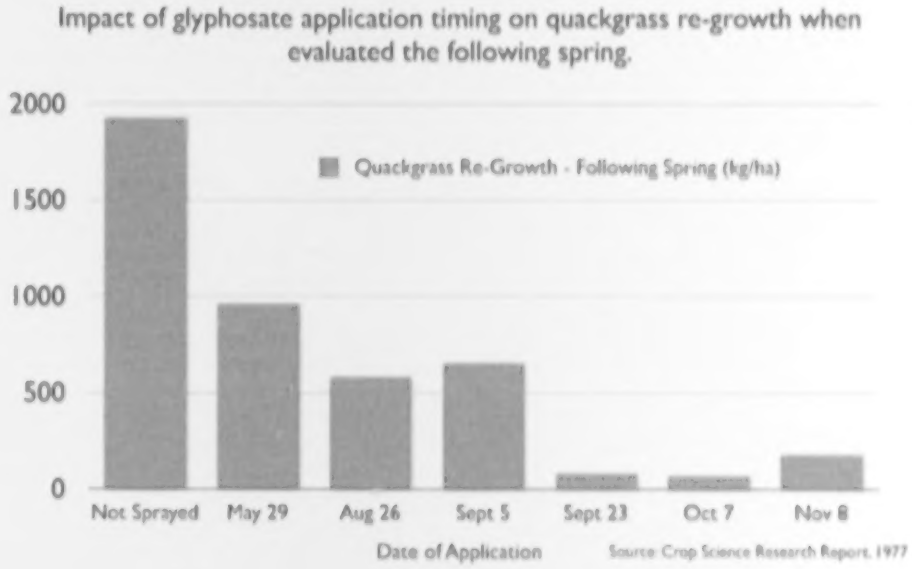
[1] HR, MR, LR, RR & NR denote respectively – high, medium, low, rare and no probabilities of profitable crop response to applied nutrient. Profitable response to applied nutrients occurs when the increase in crop value from increased yield is greater than the cost of the applied nutrient.

Importance of Managing Perennial Weeds in the Fall: Quackgrass

by Mike Cowbrough, Weed Management Field Crops Program Lead

We in the weed science business are pretty good at telling producer's to manage perennial weeds in the fall because they are controlled much better. Although its nice to believe without question, quantitative proof is always better. I recently came across a University of Guelph research report from 1977 that nicely demonstrates the reduction in quackgrass re-growth the following spring after a fall glyphosate application.

A spring application of glyphosate will reduce quackgrass re-growth the next spring (compared to doing nothing), waiting until the fall to apply the glyphosate resulted in an additional 80% reduction in re-growth.



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